Correspondence.

Railway Curve Mechanics.

To the Editor of the SCIENTIFIC AMERICAN:

As a criticism of the suggestion of your correspondent, in the SCIENTIFIC AMERICAN of June 22, I would call attention to the fact that the slipping of wheels on curves is the resultant of two components, a longitudinal one due to the greater length of the outer rail and a transverse one due to the condition that but one axle in a rigid wheel base can take a radial position. The greatest slipping effects are produced by the long, rigid wheel bases of locomotives, and the independent mounting of the wheels would reduce the sliding but very little. In the case of driving wheels differential gears would be required; and the additional machinery would be a source of danger, while the space required for it would seriously impair the efficiency of the locomotive. This is a subject which has received mathematical study and experimental investigation from the early days of railroading. G. E.

Improvised Fans on Machine Tools.

To the Editor of the SCIENTIFIC AMERICAN:

Yesterday I saw at work in the standard plant of the American Radiator Company, Buffalo, two improvised fans attached to a large milling machine. The operator of the machine, Mr. George Gebhardt, fastened on each of two rapidly rotating shafts a piece of tinned sheet iron, forming a fan about 12 inches long and 8 inches wide. The tin plate was simply curled as closely about the shaft as possible, then tightened by means of a wooden wedge. The shafts rotate about 300 times a minute, hence the fans cause a delightfully cool breeze, which not only cools the operator, but also blows away the iron dust from his presence. Thus the operator need inhale but little of such dust.

It seems to me that many thousand machine tenders in the land might profit by imitating this truly simple, useful and cheap device. The fan does not cost three cents.

Mr. Gebhardt also proposes to place similar but larger fans at intervals on the main line of shafting in shops. JAMES ASHER.

Buffalo, N. Y., June 25, 1907.

Oral Method of Teaching the Deaf.

To the Editor of the SCIENTIFIC AMERICAN:

I read with interest the article in a late issue of the SCIENTIFIC AMERICAN regarding the oral method of teaching the deaf. In the main, the article outlines the course usually pursued in all the schools of our land. However, the article gives apparently as the first sample sentence, one a trifle more difficult than is usually used. A simple sentence, with an intransitive verb, is hard enough for the first effort. Show the boy that he is to run, and teach him to write "John ran." This is a simpler matter than the sentence form given in the article. It has always been next to impossible for one not a teacher of the deaf, as the author of the article in question, to get through without making some statement about the deaf that provokes a smile on the part of the one who is familiar with the real work of teaching them, and the article in question is no exception. We do not read far in it till we come across this curious statement: "The old-fashioned finger alphabet is unknown in up-to-date institutions." Any one who is familiar with the largest and best-equipped schools in this country would characterize that as a very great mistake; one of the most modern and most successful schools in the land, in Rochester, N. Y., has a reputation as wide as the continent for turning out pupils who, in the language of that critic, Mr. Pach, of photographic fame, "know their English to the limit," having built up its name on the basis of the manual alphabet. It would be a rash writer who should say that the Rochester school did not pay proper attention to the teaching of articulation!

And what is to be thought of the claim that the four or five other schools supported by the State of New York are not up-to-date?

But the New York schools do not rank any higher than those of Ohio, Michigan, Illinois, Kentucky, Iowa, and so on along the line.

Further along in the article referred to, the statement is made that congenital mutes are so taught that at the end of their course their articulation would not lead one to think that they were deaf! Giving those of us who are doing our best to teach these children credit for all in the way of articulation that we have ever claimed, you will not have to allow us so much as that. The congenital mute who does not betray by his utterance that he is deaf, must be talking to some one whose perception is remarkably dull.

The teachers of the deaf do not make any such extravagant claims as that, but when some outsider is called in to view their work, he gets to where he thinks he must make his statement a trifle stronger than he has been told, to make it effective. These exaggerated statements do us no good, but rather tend to discredit our work. We are trying to accomplish what we may, but there are some things that we have not yet attained and some that we are not likely to. Hence these remarks. H. C. HAMMOND.

School for the Deaf, Olathe, Kansas.

Liquid Specula.

To the Editor of the SCIENTIFIC AMERICAN:

Upon reading the article by Mr. A. W. Nightingale in SCIENTIFIC AMERICAN of December 29, 1906, on the use of liquid specula for telescopes, it occurred to me that perhaps the readers of your paper would be interested in the mathematical solution of the problem, which I am giving below. The same method was used by Mendeléeff, who rotated masses of melted speculum metal and allowed it to cool while rotating, thus producing the required surface—a paraboloid of revolution. The solution of the problem is as follows:

Consider the elemental prisms drawn in the section $X\ Z$ of the surface. Since, in a liquid, the pressure at a point is equal in all directions, we may equate the centrifugal force of the horizontal prism to the liquid pressure of the vertical prism at the point P.

Now, consider an elemental volume of length dx, width dy, and height dz. We will integrate only in the X direction, and so dy and dz will be constants.

Volume $= dx\ dy\ dz$.

Mass = volume × density $= D\ dx\ dy\ dz$. D = density of liquid. Centrifugal force $= \frac{MV^2}{Rg}$. $v = wx$ where w = the angular velocity. Centrifugal force =

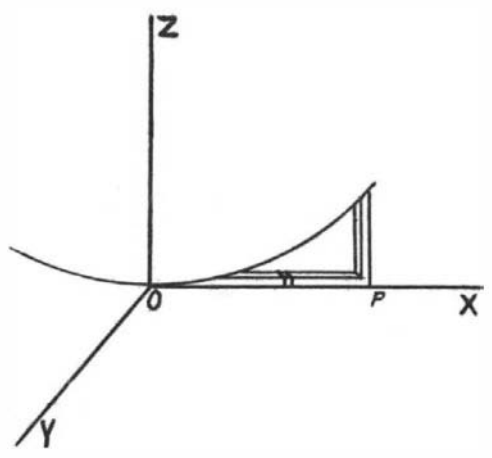
$$\int_{R=o}^{R=x} \frac{D\ dx\ dy\ dz\ (wx)^2}{xg}$$

Since D, dy, dz, w^2, and g are considered constant, they may be placed outside the integral sign or centrifugal force =

$$\frac{D\ dy\ dz\ w^2}{g} \int_{R=o}^{R=x} x\ dx = \frac{D\ dy\ dz\ w^2 x^2}{2g} \qquad (1)$$

The liquid pressure vertically will be equal to the volume times the density $= dy\ dz\ Z\ D$. (2)

dy and dz are used as dimensions of the vertical



prism, since evidently it must have the same cross section as the horizontal prism.

Equating (1) and (2) we have:

$$\frac{D\ dy\ dz\ w^2 x^2}{2g} = dy\ dz\ Z\ D \quad \text{or} \quad Z = \frac{w^2 x^2}{2g}$$

$x^2 = \frac{2g}{w^2} Z$; hence the curve is a parabola.

Comparing with the ordinary equation, $x^2 = 2pz$, $p = \frac{g}{w^2}$. Since the distance from the focus to the vertex $= \frac{1}{2}p$, and this distance is also the focal length, we have the focal length $l = \frac{g}{2w^2}$.

Changing from angular velocity w to revolutions per second n, we have, since $w = 2\pi n$—

$$l = \frac{g}{2(2\pi n)^2} = \frac{g}{8\pi^2 n^2} \text{ hence } n = \sqrt{\frac{g}{8\pi^2 l}}$$

Using this result in the solution of a practical problem, let us suppose we wish to make a mirror of focal length 50 feet.

$$n = \sqrt{\frac{32.2}{8\pi^2 50}} = 0.1133 \text{ rev. per sec. or 1 rev. in 8.82 seconds.}$$

For a focal length of 20 feet $n = \sqrt{\frac{32.2}{8\pi^2 20}} = 0.565$ rev. per sec. or 1 rev. in 1.77 seconds.

It is, of course, quite probable that it would be impossible to rotate the mirror steadily enough to prevent the formation of ripples on its surface, and these would ruin its value as an optical instrument. Also, it is improbable that the earth itself is free enough from tremors to avoid the same difficulty. The mirror could only be used in a vertical position; however, rays from other directions might be reflected into it by plane mirrors. WILLIAM C. WOODLAND.

Warren, O

Progress on the Culebra Cut.

To the Editor of the SCIENTIFIC AMERICAN:

I have read lately a very concise and clear article by Roy D. Hunter on "The Panama Canal in April, 1907," in which he states that in the month of last November about 422,000 cubic yards of earth and rock were removed; in March of this year 815,000 yards; in April 879,000 yards, and that hereafter the amount excavated will probably be 1,000,000 cubic yards per month. That on the 1st of last May there remained 51,000,000 cubic yards to be excavated in the Culebra Cut, which is nine and one-half miles long, and in which fifty-three steam shovels are at present at work making the progress stated. If these are the facts it appears that the Culebra Cut—which is the part of the canal requiring the most labor and time to construct—will probably be completed in fifty-one months from the first of May last.

If this be so, I would ask, Why cannot the number of steam shovels be doubled and the canal be completed in twenty-six months? This would give to each shovel a section of the cut 473 feet in length, which it would seem would be sufficient room for the shovel to be worked its full capacity.

It would then be only a question of sufficient cars, locomotives, switches, railroad tracks, and men to take care of the dirt put out by the doubled number of shovels. This is assuming that the three dams and the locks could each be completed as soon as the great Culebra Cut can be finished—and this is taken for granted by the present layman inquirer.

Will not the advantage to the nation by this shortening of the time of the completion of the canal ready for use and for a possible contingency of national necessity in case of war, be so great as fully to justify the use of all reasonable means to hasten the work? That is the way it seems to A LAYMAN.

Trinidad, Colorado, June 22, 1907.

[It is now considered by the engineers of the canal that the determining factor, as to the time of completion of the Panama Canal, is the Gatun Dam and Locks, and not the excavating of the Culebra Cut.—ED.]

The Current Supplement.

The current SUPPLEMENT, No. 1645, contains among other articles of interest, a contribution on gypsum plaster and gypsum products as building materials, crammed with much valuable technological information. The "Psycho-physical Aspect of Climate" is the title of an article which gives a psychological reason why Englishmen and New Englanders talk about the weather. The three articulated compound locomotives now in course of construction for the Erie Railroad will be the heaviest and most powerful locomotives ever built. The engines are described and illustrated in the current SUPPLEMENT. Alfred Sang contributes a paper on the art of galvanizing. The aeronautical observatory recently erected near Lindenberg, Germany, is destined to become a center for the investigation of the atmosphere by means of kites and balloons. For this reason Dr. Alfred Gradenwitz's article on the observatory, illustrated as it is with many excellent pictures, should be read with interest. The interest aroused by the exhibition of the model of the Brennan monorail car renders the moment opportune for a few elementary notes on the theory of the gyroscope. For that reason an article on the gyroscope will be found in the current SUPPLEMENT. In two lectures delivered at the Royal Institute, H. F. Newall, president of the Royal Astronomical Society, gave an interesting review of the state of our knowledge of stellar spectroscopy. These lectures are condensed in the current SUPPLEMENT. René Bache describes and illustrates Venomous Insects. The Artificial Dispersion of Fog is a subject discussed by M. M. Dibos. S. P. Fergusson writes on meteorological phenomena of mountain summits.

Peary Delayed.

Commander Robert E. Peary will not start for the North Pole until the middle of July. Delay in getting the steamer "Roosevelt" ready made it necessary to postpone the date of sailing.

The repairs to the "Roosevelt" have been more extensive than expected. Among the alterations is the installation of four new boilers. With these, Commander Peary said, he hoped to make up four or more days in his run to North Grantland. He will have to hurry to get into quarters before the Arctic winter sets in. The size of the forecastle is being increased, so that it will extend from the topgallant forecastle to the forward part of the main hatch, and will accommodate a greater number of Esquimaux than on the previous runs.